We claim:

1. A particle identification system comprising:

(a) a substrate having a topside portion, backside portion and a flow system, the flow system comprising a flow channel for accepting the flow of a stream of particles to be identified;

(b) a magnetic structure in physical communication with the topside and backside portions of the substrate, the magnetic structure comprising at least two pole pieces, each pole piece comprising a plurality of discrete pole pieces; the magnetic structure generating a magnetic field for acting on magnetically susceptible particles in the stream; and

(c) a bioferrograph for identifying the presence of magnetically susceptible particles.

2. The system of claim 1 wherein the substrate comprises a material selected from the group consisting of: silicon, glass, ceramics, and plastics.

3. The system of claim 1 wherein the flow system further comprises an inlet portion and an outlet portion and the inlet portion and the outlet portion each comprise of plurality of flow dividers.

4. The system of claim 3 wherein the inlet portion comprises a carrier fluid inlet and a particle feed.

5. The system of claim 4 wherein the particle feed is disposed between the plurality of inlet flow dividers.

6. The system of claim 1 wherein the bioferrograph comprises a sensor portion and a magnetic portion, the sensor portion disposed between the outlet flow dividers.

7. The system of claim 6 wherein the sensor portion comprises at least one impedance-type sensor.

8. The system of claim 7 wherein the impedance-type sensor comprises at least two electrodes for sensing contact with a particle.

9. The system of claim 6 wherein the sensor portion comprises at least one resonant-type sensor.

10. The system of claim 9 wherein the resonant-sensor comprises at least one resonating material for sensing contact with a particle.

11. The system of claim 6 wherein the sensor portion comprises at least one magnetoresistive sensor.

12. The system of claim 11 wherein the magnetoresistive sensor comprises at least one sensing section having first and second electrodes and a magnetoresistive material therebetween.

13. These system of claim 1 wherein the topside comprises a transparent glass layer.

14. A bioferrograph for identifying magnetically susceptible particles, the bioferrograph comprising:

(a) a silicon substrate having a topside and backside;

(b) the topside comprising a sensor portion for sensing the presence of at least one magnetically susceptible particle; and

(c) the backside comprising a magnetic portion having at least two pole pieces separated by a gap.

15. The bioferrograph of claim 14 wherein the sensor portion comprises at least one impedance-type sensor.

16. The system of claim 15 wherein the impedance-type sensor comprises at least two electrodes for sensing contact with a particle.

17. The system of claim 14 wherein the sensor portion comprises at least one resonant-type sensor.

18. The system of claim 17 wherein the resonant-sensor comprises at least one resonating material for sensing contact with a particle.

19. The system of claim 14 wherein the sensor portion comprises at least one magnetoresistive sensor.

20. The system of claim 19 wherein the magnetoresistive sensor comprises at least one sensing section having first and second electrodes and a magnetoresistive material therebetween.

21. A magnetic structure for a particle separation system comprising:

(a) a first pole piece structure;

(b) a second pole piece structure;

(c) a first gap between the first and second pole piece structures; and

(d) the first and second pole pieces each comprising a plurality of discrete pole pieces and a plurality of secondary gaps disposed between the discrete pole pieces; and each discrete pole piece comprising an orthogonal geometry.

22. The magnetic structure of claim 21 wherein the plurality of discrete pole pieces comprise at least a first and a second orthogonal geometry.

23. The magnetic structure of claim 21 wherein the plurality of discrete pole pieces comprise a common length dimension.

24. The magnetic structure of claim 21 wherein the plurality of discrete pole pieces comprises a common height dimension.

25. The magnetic structure of claim 21 wherein the plurality of discrete pole pieces and the plurality of secondary gaps are configured to generate a substantially uniform magnetic field in the first gap.

26. A magnetic structure for a particle separation system comprising:

(a) a first pole piece structure;

(b) a second pole piece structure;

(c) a first gap between the first and second pole piece structures; and

(d) the first and second pole pieces each comprising a plurality of discrete pole pieces and a plurality of secondary gaps disposed between the discrete pole pieces; and the plurality of discrete pole pieces and the plurality of secondary gaps configured to generate a substantially uniform magnetic field in the first gap.

27. A particle identification system comprising:

(a) a micro-processor based computer system; and

(b) a fluidic chip having:

(i) a substrate having a topside portion, backside portion and a flow system, the flow system comprising a flow channel for accepting the flow of a stream of particles to be identified;

(ii) a magnetic structure in physical communication with the topside and backside portions of the substrate, the magnetic structure comprising at least two pole pieces, each pole piece comprising a plurality of discrete pole pieces; the magnetic structure generating a magnetic field for acting on magnetically susceptible particles in the stream; and

(iii) a bioferrograph for identifying the presence of magnetically susceptible particles; said bioferrograph in circuit communication with the computer systems.

28. The system of claim 27 wherein the fluidic chip comprises at least one analog-to-digital converter.

29. The system of claim 27 wherein the fluidic chip comprises a fluidic and magnetic activation unit.

30. A method for making a magnetic structure comprising the steps of:

(a) providing a substrate;

(b) forming a molding structure on the substrate;

(c) forming one or more molding surfaces by removing portions of the molding structure; and

(d) depositing magnetic material on the substrate and against the molding structure.

31. The method of claim 30 wherein step (b) comprises the step of applying a photoresist on the substrate.

32. The method of claim 30 wherein the step of removing portions of the molding structure comprises the step of machining away in a step-wise manner one or more portions of the molding structure so as to approximate a hyperbolic surface.

33. The method of claim 30 wherein step (d) comprises the step of plating magnetic material on the substrate.

34. A particle separation system having bioferrograph, said bioferrograph comprising:

(a) a light source;

(b) a silicon substrate having a topside and backside;

(c) said topside comprising a sensor portion for sensing the presence of at least one immunofluorescently labeled particle;

(d) the backside comprising a magnetic portion having at least two pole pieces separated by a gap; and

wherein said light source emits light for exciting said at least one immunofluorescently labeled particle and said sensor portion detects the luminosity of said at least one immunofluorescently labeled particle.

35. The system of claim 34 wherein said light source comprises a light emitter and at least one optical fiber for directed light towards said sensor portion.

36. The system of claim 34 further comprises a computerized quantification system for correlating the detected luminosity with a quantity of particles.